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plants than I had expected. The leaves of grape were fairly cleaned, but the fruit was not, and the effect on the leaves of plum, prune and oak was slight: the dust was on them in quantity. This rain, furthermore, came unusually early.

The climatic conditions here being so different from those elsewhere, I feel compelled to expect the results which I have indicated, unless the operation of the cement manufactory is so modified as to check the discharge of dust in quantity.

GEORGE J. PEIRCE

STANFORD UNIVERSITY, CAL.,

October 1, 1909

#### THE ALGÆ OF THE ITHACA MARSHES

INVESTIGATIONS on the fauna and flora of the marshes of the upper Cayuga Lake Basin during the past summer were continued at the Biological Field Station of Cornell University. Various studies were in progress. The writer undertook the study of the algæ. His investigations were made in connection with the work of Dr. J. G. Needham, and were directed toward the solution of the problem of the algal food supply of herbivorous aquatic animals that are used as food by fishes. No local data being available, a preliminary study of the algæ of the marshes was undertaken. With little variety of conditions, a great number of species was not to be expected; however, nearly all the genera of the commoner fresh-water algæ were represented, and perhaps a more thorough search would supply the missing ones. Over seventy genera were found, but the species were not all carefully worked out, owing to the unsatisfactory state of their literature. Material for future work on them has been preserved and will be worked over later.

The genus *Chætophora* is especially abundant in this region, and is represented by four species, three of which, *C. elegans*, *C. incrasata* and *C. pisiformis*, are very common. The dominance of this genus, and the fact that it is used extensively as food by aquatic animals that have importance as food for fishes, lead us to expect that it will be of some economic

value and a special study of its habitat and capabilities of increase will be made in the future. The study of the optimum conditions for the development of several species of *Spirogyra*, *Mougeotia* and *Chætophora* was undertaken in order to facilitate the cultivation of these algæ, should they prove of economic importance. The results from these experiments, and from observations carried on in nature, lead us to believe that such forms might with proper facilities be raised on a large scale with good results; perhaps in such quantities as Dr. Needham's previous studies of artificially reared may-flies indicate may be demanded.

A beginning was also made in the study of the periodicity of the marsh algæ. It is hoped that facilities may be provided in the future for carrying on observations continuously for several years, as this seems to be the only way in which exact information concerning the ecology of the algæ can be obtained.

An interesting Phycomycete, parasitic on *Volvox globator*, was discovered during August, and this fungus will be described after further work has been done on its life history.

H. A. ANDERSON

#### THE MOLECULAR CONSTITUTION OF SOLIDS<sup>1</sup>

ACCORDING to the author, it is supposed and generally so stated, owing to complex movements and forces supposed to be present in solid bodies, there must be special difficulties to which it is due that the molecular thermodynamics and kinetics of solids can not be fully accounted for on the same basis as those of the gaseous bodies.

The present paper is calculated to show that the supposed difficulties are largely imaginary and that there are a notable number of solid and liquid substances, for which, according to the calculations and tables presented by the author, no essential difference exists regarding the mode and kinetic energy of the motion of their molecules as compared with those of gaseous bodies.

<sup>1</sup>Abstract of paper presented at the regular meeting of the Chicago Academy of Sciences, July 27, 1909.

In support of this, it is shown that the total heat energy at the melting point of metals in which the molecule probably consists of one or but few atoms can be found by doubling the latent heat of melting ( $2l$ ) while the total heat energy of the liquid at the same point can be found by trebling the latent heat of melting ( $3l$ ).

The author further shows that the amount of heat energy of a solid body thus calculated is equivalent to the total kinetic energy ( $Mv^2/2$ ) of the molecules, calculated from the molecular velocity of the body, which velocity is determined in the same manner as is done in case of gaseous bodies in accordance with the kinetic gas theory.

As another proof of the author's assertions it is shown that the heat energy of many solid bodies calculated by multiplying the absolute temperature degrees of the melting point with an amended specific heat ( $Ts$ ) is found to be practically identical with the energy quantities ( $2l$ ) and ( $Mv^2/2$ ) found as before stated.

Tables are submitted illustrating these conditions for mercury, silver, cadmium, tin, bismuth, potassium and platinum.

It is also shown in another table that chemical combinations such as water, saltpeter and chloral-hydrate follow the same rule if the splitting of their molecule at melting is duly considered.

To further establish the identity of principles of the kinetics of solids and gases a third table demonstrates that the interior energies of the permanent gases can be calculated with correct results on the basis of molecular velocities deducted from the latent heat of melting of solids.

As another corollary an original experiment is quoted according to which a drop of water is suspended in a liquid of equal specific gravity below its freezing-point when the globular form of the drop at once changes into an ellipsoidal form as soon as it freezes, showing that the abstraction of the latent heat of melting is accompanied by a great loss of energy in the perpendicular direction.

Some of the principal results of these in-

vestigations may, according to the author's summary, be itemized as follows:

1. The absolute zero of temperature  $-273^\circ$  Cels. as derived from the kinetic conditions of gases may be derived from the kinetic conditions (molecular movements) of solids by identical processes of reasoning and calculation.

2. In the case of many solid elements, as well as also for many combinations of simple constitution, their total internal heat energy is chiefly kinetic energy approximately expressible by the product of their corrected specific heat with the absolute temperature ( $Ts_1$ ).

3. The heat energy of such solid elements at their melting-points may likewise be expressed approximately by doubling their latent heat of melting ( $2l$ ) and in the case of chemical combinations in which the molecule splits during the melting by  $1l$ . The total heat energy of the liquid body at its melting-point being three times its actual latent of melting ( $3l$ ).

4. The molecular velocities of solids may be calculated from the same principles on which the kinetic theory of permanent gases is based.

5. The total kinetic energy of a body calculated according to these velocities is approximately the same as that derived from the latent heat of melting and also the same as that derived from the corrected specific heat multiplied with the absolute temperature.

6. The three different arithmetical expressions for the kinetic energy of a solid body at its melting-point, viz.,  $Ts$ ,  $2l$  and  $Mv^2/2$ , every one of which is derived from different experimental data and by different processes of reasoning give approximately identical results, thereby making all conditions of matter amenable to the same general kinetic principles, at least with respect to the substances under consideration in this treatise.

7. The molecular constitution of solid bodies is not essentially different, and in some cases apparently even less complex, than that of gaseous bodies, so that the translatory

energy of elastic spheres alone may suffice to account for their kinetic conditions in many respects.

J. E. SIEBEL

CHICAGO, ILL.

#### SOCIETIES AND ACADEMIES

##### THE ANTHROPOLOGICAL SOCIETY OF WASHINGTON

THE 434th regular meeting of the society was held October 12, 1909, in the West Hall of the University Building, George Washington University, with President Fewkes in the chair.

The paper of the evening was by Dr. Ales Hrdlicka, whose subject was "The Anthropology of Egypt in the Light of Recent Observations." This dealt mainly with the results of Dr. Hrdlicka's expedition to Egypt, carried out during the first part of the current year under the auspices of the Metropolitan Museum of Art and the National Museum. The expedition brought, besides other results, very important additions to the skeletal collection in the National Museum.

The speaker, after pointing out the importance to anthropology of studies on the Egyptians, and mentioning the important work that has been and is being done in Egyptian research and exploration by American men of science, particularly Breasted, Reisner, Lythgoe and Davis, proceeded to discuss the results of recent investigations on well identified skeletal remains from that country, ranging from the earliest to the latest periods, and also the results of his examinations of the living remnants of the Egyptians.

The principal facts brought out were as follows:

Contrary to the hitherto prevailing opinion, there were, in the course of time, marked changes in the physique, particularly the form of the skull, of the Egyptians, the ancient crania being, on the average, decidedly longer and narrower than those of the later periods.

The Egyptians originated, in all probability, from more than one stream of anthropologically related people, the principal elements being Libyan and Puntite or Arabian.

Negro admixture was very small up to the time of the empire. A more noticeable addition consisted of a brachycephalic strain coming probably from Asia Minor. This is traceable from the earliest times and became important during the Greek and Roman occupation.

The Egyptians were light to medium brown in color, usually with black, straight to slightly curly hair, a moderate stature and muscular development. They approached closely in all their important features the north Africans and south-

western Asiatics and with these the European dolichocephalic whites.

At the present time the ancient Egyptians may be considered as practically extinct or rather obliterated. The actual population of the country is an amalgamation of the original inhabitants with the Arabs, Negroes and many elements from the northwest, north and northeast of the Nile Valley.

In certain localities traces of the old Egyptians still can be recognized. This seems to be principally the case in the great oasis. A series of 155 natives of this oasis were closely studied, also photographed. The data are being prepared for publication.

The paper was discussed by Professor Holmes, Dr. Casanowicz, Dr. Folkmar, Dr. Hough, Dr. Fewkes and others.

JOHN R. SWANTON,

*Secretary*

##### THE AMERICAN CHEMICAL SOCIETY. NEW YORK SECTION

THE first regular meeting of the session of 1909-10 was held at the Chemists Club on October 8.

Dr. Morris Loeb, in taking the chair, made a short address. He spoke of the plans of the section for the approaching session and especially commented upon the desirability of a chemical museum, expressing the hope that it might be housed together with the society library in the new quarters of the Chemists' Club.

Dr. A. P. Hallock gave a report of the general meeting of the society at Detroit, calling attention to the hospitality and very enjoyable entertainment offered by the Detroit Section.

Professor M. A. Rosanoff, of Clark University, read a paper by C. W. Easley and himself "On the Partial Vapor Pressures of Binary Mixtures." This paper is published in full in the current number of the *Journal of the American Chemical Society*.

Professor H. C. Sherman presented "A Source of Error in the Examination of Foods for Salicylic Acid."

The members present were invited to attend a special meeting of the Chemists' Club held after the adjournment of the meeting of the section. At this meeting the plans of the building committee for a larger and more adequate club house were adopted, insuring a home for the chemists of New York unexcelled in this country or probably abroad.

C. M. JOYCE,

*Secretary*